Evaluation and Dissemination of Data for Prompt Neutron Activation Analysis*

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Neutron-induced Prompt Gamma-ray Activation Analysis (PGAA) is a non-destructive radioanalytical method capable of rapid or in situ simultaneous multi-element analysis involving the entire periodic table from hydrogen to uranium. Typically twenty or more elements can be identified in a single sample. Both elemental concentrations and isotopic ratios can be determined.

The availability of large Compton-suppressed Ge detectors and high-quality guided (or filtered) thermal and cold neutron beams at high and medium flux reactors has greatly facilitated the development of PGAA in recent years. PGAA has been widely applied in materials science, chemistry, geology, mining, archaeology, environment, food analysis, medicine and other areas.

Inaccuracy and incompleteness of the data used in this method are a significant handicap to the qualitative and quantitative analysis of complicated gamma-ray spectra. Accurate and complete neutron capture gamma-ray energy and intensity data are also important in other fields like shielding calculations and astrophysics. Only limited data are available for cold neutron capture calculations and k_0 determination, so a convenient standardization method for PGAA needs to be established. These deficiencies were recognized during the meeting on the Coordination of the Nuclear Structure and Decay Data Evaluator's Network in Budapest, 14-18 October 1996. An IAEA Coordinated Research Project on the Development of a Database for Prompt Gamma-ray Activation Analysis was started in 1999.

We are updating isotopic data from ENSDF and using that information to assign γ-rays, observed in elemental data measured at the Budapest reactor, to their level schemes. This will allow the integration of the more complete isotopic data with the more precise Budapest intensities to generate a complete PGAA database of energies, cross section γ-ray yields, k_0 values, and other quantities. The first stage of this analysis to assign the more intense γ-rays is nearly complete. This will provide a preliminary database for identifying impurity lines in the elemental data. The second stage of analysis will be to integrate all of the data into the PGAA database.

Dissemination software is being developed using HTML, Javascript, and JAVA in collaboration with EVITech. Beta-test versions are available and will be released pending completion of the CRP.

Footnotes and References

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